

References

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APPENDIX I

Table 1 Typical data of high impact polystyrene (grade HI650).

Item	Test Method(ASTM)	Unit	Typical data
Melt flow index	D-1238	g/10 min.	6-9
Izod notch impact	D-256	kg-cm/cm	> 9.3
Tensile strength	D-638	kg/cm ²	> 180
Flexural strength	D-790	kg/cm ²	> 370
Vicat softening temperature	D-1525	°C	> 91

Table 2 Product Specification of CS 3PE-330 (E-Glass Chopped Strands).

Item	unit	specification
Strand length	mm.	3±0.5
Loss on ignition	%	0.8±0.15
Moisture content	%	maximum 0.10
Bulk density	g/cm. ³	minimum 0.60
Alkali contents	%	maximum 0.80

Table 3 Product Specification of PF E 301 (E-Glass Milled Fibers).

Item	unit	specification
Particle size(100 mesh pass)	%	minimum 85
Loss on ignition	%	maximum 0.2
Moisture content	%	maximum 0.1
Foreign substance	piece	maximum 25

Table 4 Typical physical properties of gamma-Glycidoxypropyltrimethoxysilane (silane A-187).

Item	data
Formula Molecular Weight	236.4
Physical Form	light straw
Specific Gravity(25 ^o C)	1.069
Refractive Index(at 25 ^o C)	1.427
Boiling Point	290 ^o C

APPENDIX II

Table 5 Physical Analysis Data Sheet of HIPS/GF Composites.

Sample No.	Analysis No.	NI	TS	TM	FS	FM	HDT	VST
2	1	10	219	2.55	391	2.38	86.5	92.1
	2	9.6	217	2.47	395	2.44	86.2	92
	3	9.8	214	2.63	393	2.31	85.9	98.8
	Average	9.8	217	2.55	393	2.38	86.2	92
3	1	8.5	241	3.1	466	2.96	89.2	94.6
	2	9.1	243	3.5	463	2.95	89.3	94.3
	3	8.8	239	3.3	460	2.97	89.3	94.5
	Average	8.8	241	3.3	463	2.96	89.3	94.5
4	1	9.1	232	2.52	408	2.32	87.9	92.4
	2	7.17	233	2.4	408	2.42	87.6	92.3
	3	9.2	230	2.45	407	2.38	87.8	92.5
	Average	8.49	232	2.46	408	2.37	87.8	92.4
5	1	9.2	225	2.53	400	2.49	87.3	92.3
	2	9.7	226	2.56	403	2.49	87.2	91.1
	3	9.9	226	2.55	406	2.48	87.3	91.8
	Average	9.6	226	2.55	403	2.49	87.3	91.7
6	1	9.9	224	2.5	400	2.5	84.1	90.4
	2	9.6	224	2.6	400	2.5	85.1	90.2
	3	10	225	2.6	399	2.4	85.1	90.3
	Average	9.8	224	2.6	400	2.5	84.8	90.3

Remarks : NI = Izod notched impact
 TS = Tensile strength
 TM = Tensile modulus
 FS = Flexural strength
 FM = Flexural modulus
 HDT = Heat distortion temperature
 VST = Vicat softening temperature

Table 5 (Continued)

Sample No.	Analysis No.	NI	TS	TM	FS	FM	HDT	VST
7	1	9.1	304	3.6	486	3.85	89.7	96.8
	2	9	306	3.8	487	3.73	89.9	96.7
	3	8.9	305	4.1	485	3.78	90	96.7
	Average	9	305	3.8	486	3.79	89.9	96.8
8	1	8.7	334	4.2	520	4.18	89.9	96.9
	2	8.6	330	4	529	4.19	90	96.7
	3	8.8	332	4.1	525	4.17	89.8	96.8
	Average	8.7	332	4.1	524	4.18	89.9	96.8
9	1	10.1	314	3.8	534	5	90.7	97.6
	2	9.8	316	4.2	525	5	90.5	97.8
	3	10	312	4.6	515	5	90.5	97.3
	Average	10	314	4.2	525	5	90.6	97.6
10	1	9.62	235	2.66	398	2.76	89.7	94
	2	9.71	237	2.9	398	2.6	89.7	93.8
	3	10.06	238	2.77	397	2.67	89.6	93.8
	Average	9.8	237	2.78	398	2.68	89.7	93.9
11	1	9.2	222	2.46	406	2.57	86.7	92.8
	2	9.5	226	2.5	409	2.59	87.7	92.9
	3	9.1	224	2.47	408	2.56	87.2	93
	Average	9.3	224	2.48	408	2.58	87.2	92.9

Table 5 (Continued)

Sample No.	Analysis No.	NI	TS	TM	FS	FM	HDT	VST
12	1	9.4	297	3.91	3.05	483	89.9	95.8
	2	9.24	298	3.84	3.3	487	90	95.5
	3	9.65	295	3.77	2.8	485	89.9	95.1
	Average	9.43	297	3.84	3.05	485	89.9	95.5
13	1	9.1	338	4.1	1.7	536	90.2	96.7
	2	9.2	338	4.4	1.4	535	90.4	96.9
	3	9.3	339	4.6	1	531	89.9	96.8
	Average	9.2	338	4.4	1.4	534	90.2	96.8
14	1	9.7	314	4.1	1.4	494	89.6	99.4
	2	9.5	320	3.8	1.4	490	89.6	98
	3	9.5	319	4.2	1.4	493	89.6	98.7
	Average	9.6	318	4	1.4	492	89.6	98.7
15	1	9.3	315	4.1	1.8	504	89.1	95.7
	2	9.3	315	4.3	1.8	502	88.7	95.4
	3	9.6	315	4.1	1.8	503	89.2	95.9
	Average	9.4	315	4.2	1.8	503	89	95.7
16	1	9.6	233	3.09	7.4	451	84.8	92.4
	2	9.6	239	3.18	4.6	452	84.8	90.5
	3	9.9		3.15	6.3	452	84.8	94.3
	Average	9.7	236	3.14	6.1	452	84.8	92.4

Table 5 (Continued)

Sample No.	Analysis No.	NI	TS	TM	FS	FM	HDT	VST
17	1	9.9	178	2.3	344	2.11	86.1	90.8
	2	10.1	179	2.4	346	2.19	86.2	90.9
	3	10	177	2.2	341	2.27	86.2	90.9
	Average	10	178	2.3	344	2.19	86.2	90.9
18	1	9.38	202	2.64	392	2.36	86.7	92.8
	2	9.52	201	2.67	390	2.38	86.5	94
	3	9.43	199	2.7	388	2.4	86.8	91.5
	Average	9.43	201	2.67	390	2.38	86.7	92.8
19	1	9.2	201	2.5	397	2.35	86.1	91.6
	2	9.4	201	2.4	394	2.36	86.2	91.5
	3	8.7	201	2.3	391	2.37	86	91.4
	Average	9.1	201	2.4	394	2.36	86.1	91.6
20	1	9.9	198	2.6	375	2.5	84.8	90.6
	2	9.7	196	2.8	376	2.3	84.6	90.8
	3	9.5	199	3	377	2.1	85	90.4
	Average	9.7	198	2.8	376	2.3	84.8	90.6
21	1	9.7	206	2.04	370	2.13	84.6	90.8
	2	9.5	202	2.02	369	2.12	84.2	90.7
	3	9.7	204	2	368	2.13	84.4	90.8
	Average	9.6	204	2.02	369	2.13	84.4	90.8

Table 5 (Continued)

Sample No.	Analysis No.	NI	TS	TM	FS	FM	HDT	VST
22	1	9.4	174	2.4	345	2.49	86	91.8
	2	9.6	174	2.3	345	2.47	85.7	91.8
	3	9.3	174	2.4	345	2.45	85.9	91.7
	Average	9.4	174	2.4	345	2.47	85.9	91.8
23	1	7.8	189	2.6	484	2.62	86	91.6
	2	7.4	191	2.4	490	2.64	86.2	91.5
	3	7.6	191	2.7	485	2.6	86.3	91.6
	Average	7.6	190	2.6	486	2.62	86.2	91.6
24	1	9.1	193	2.9	388	2.67	85.8	91.2
	2	8.7	194	3	389	2.58	86.1	91
	3	8.7	194	2.8	387	1.49	86.1	91.3
	Average	8.8	194	2.9	388	2.58	86	91.2
25	1	8.6	179	2.9	364	85.5	91	91.1
	2	8.8	177	2.6	363	85.4	91.2	91.2
	3	8.5	181	2.9	367	85.3	91.3	91.3
	Average	8.6	179	2.8	365	85.4	91.2	91.2
26	1	9.1	187	2.1	362	2.63	84.9	90.7
	2	8.5	181	2.2	359	2.69	85.2	90.5
	3	8.7	185	2.2	361	2.65	85.2	90.3
	Average	8.8	184	2.2	360	2.66	85.1	90.5

Table 5 (Continued)

Sample No.	Analysis No.	NI	TS	TM	FS	FM	HDT	VST
27	1	8.3	164	2.7	338	2.87	86.6	92
	2	8.3	165	3.1	344	2.89	86.4	92
	3	8.6	166	2.8	343	2.85	86.5	91.9
	Average	8.4	165	2.9	342	2.87	86.5	92
28	1	7.7	197	2.9	385	2.66	86.6	91.9
	2	8.33	195	2.9	386	2.59	86.6	91.9
	3	9.49	196	3	387	2.64	86.5	91.8
	Average	8.51	196	2.9	386	2.63	86.6	91.9
29	1	6.4	195	3.1	390	2.78	85.8	92
	2	6.2	191	3.1	388	2.7	85.4	91.3
	3	6.1	191	3.4	391			
	Average	6.2	192	3.2	390	2.74	85.6	91.7
30	1	6.1	186	2.2	372	2.87	85	91.3
	2	5.8	181	2.4	375	2.93	85.2	91.4
	3	5.1	182	2.5	374	2.99	85.4	91.4
	Average	5.7	183	2.4	374	2.93	85.2	91.4
31	1	7.4	170	3	364	2.73	85	91.2
	2	7.6	171	3.1	362	2.65	84.9	91.1
	3	7.2	169	2.9	360	2.7	85.1	91.3
	Average	7.4	170	3	362	2.69	85	91.2

Table 6 Physical Properties of HIPS with Chopped glass fiber.

PROPERTY	CHOPPED FIBER 5%					CHOPPED FIBER 10%					CHOPPED FIBER 15%				
	2	3	4	5	6	7	8	9	10	11	12	13	14	14	16
NI	9.8	8.8	8.5	9.6	9.8	9	8.7	10	9.8	9.3	9.4	9.2	9.6	9.4	9.7
TS	217	241	232	226	224	305	332	314	237	224	297	338	318	315	236
TM	2.55	3.3	2.46	2.55	2.6	3.8	4.1	4.2	2.78	2.48	3.84	4.4	4	4.2	3.14
FS	393	463	408	403	400	486	524	525	398	400	485	534	503	492	452
FM	2.38	2.96	2.37	2.49	2.5	3.79	4.18	5	2.68	2.58	3.49	4.34	4.42	4.46	3.51
VST	92	94.5	92.4	91.7	90.3	96.8	96.8	97.6	93.9	92.9	95.5	96.8	98.7	95.7	92.4
HDT	86.2	89.3	87.8	87.3	84.8	89.9	89.9	90.6	89.7	87.2	89.9	90.2	89.6	89	84.8
SILANE CONTENT	0	0.1	0.2	0.3	0.4	0	0.1	0.2	0.3	0.4	0	0.1	0.2	0.3	0.4

Table 7 Physical properties of HIPS with milled glass fiber.

PROPERTY	MILLED FIBER 5%					MILLED FIBER 10%					MILLED FIBER 15%				
	SAMPLE NUMBER					SAMPLE NUMBER					SAMPLE NUMBER				
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
NI	10	9.4	9.1	9.7	9.6	9.4	7.6	8.8	8.6	8.8	8.4	8.5	6.2	5.7	7.4
TS	178	201	201	198	204	174	190	194	179	184	165	196	192	183	170
TM	2.3	2.67	2.4	2.8	2.02	2.4	2.6	2.9	2.8	2.2	2.9	2.9	3.2	2.4	3
FS	344	390	394	376	369	345	486	388	365	360	342	386	390	374	362
FM	2.19	2.38	2.36	2.3	2.13	2.47	2.62	2.58	2.51	2.66	2.87	2.63	2.74	2.93	2.6
VST	90.9	92.8	91.6	90.6	90.8	91.8	91.6	91.2	91.2	90.5	92	91.9	91.7	91.4	91.2
HDT	86.2	86.7	86.1	84.8	84.4	85.9	86.2	86	85.4	85.1	86.5	86.6	85.6	85.2	85
SILANE CONTENT	0	0.1	0.2	0.3	0.4	0	0.1	0.2	0.3	0.4	0	0.1	0.2	0.3	0.4

APPENDIX III

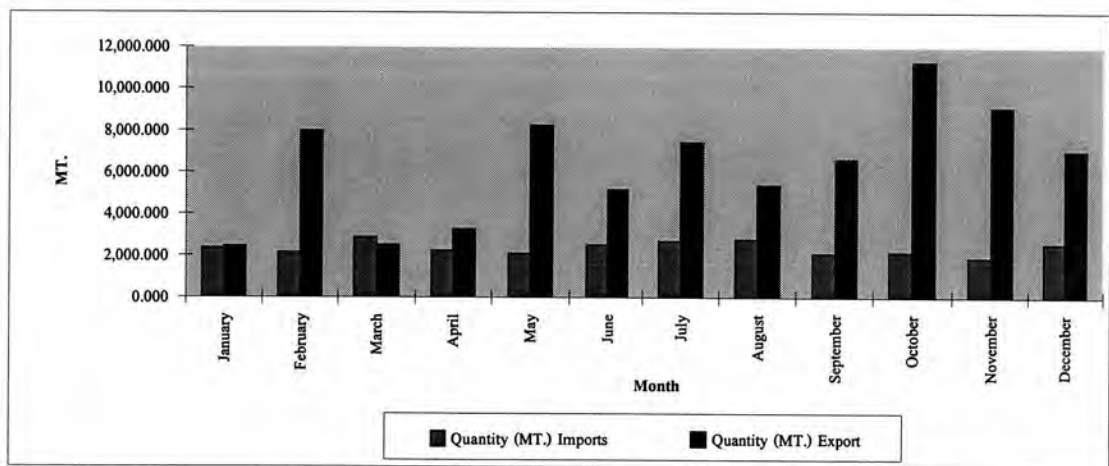


Figure 1 The amount of import and export of HIPS from January-December 1997 in Thailand

Table 8 The Amount of Import and Export of HIPS from
January-December 1997 In Thailand

Month	Quantity (MT.)	
	Imports	Export
January	2,356.815	2,446.725
February	2,133.843	7,945.238
March	2,867.252	2,512.564
April	2,236.847	3,268.280
May	2,098.724	8,240.536
June	2,518.346	5,158.803
July	2,689.911	7,439.338
August	2,767.893	5,387.969
September	2,098.504	6,620.016
October	2,175.759	11,284.040
November	1,898.906	9,085.189
December	2,566.443	7,007.415
Total	28,409.243	76,396.113
Average	2,367.437	6,366.343

APPENDIX IV

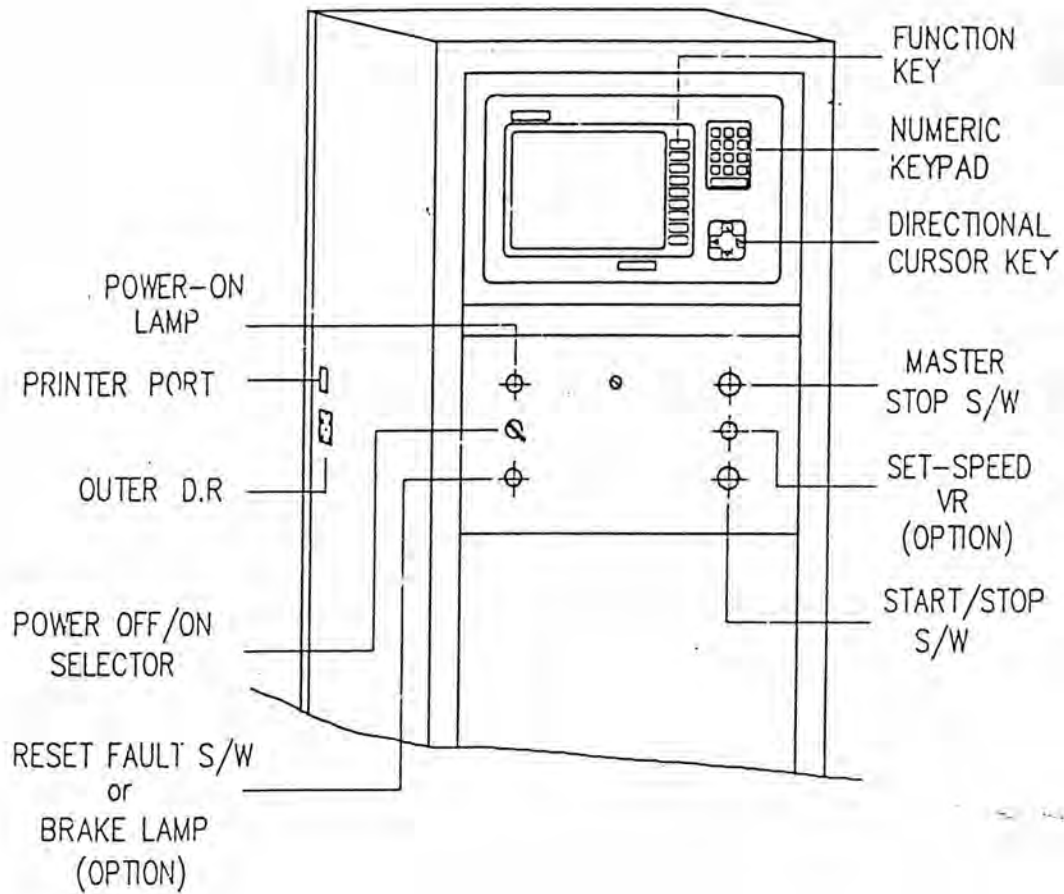


Figure 2 Horizontal Balancing Machine

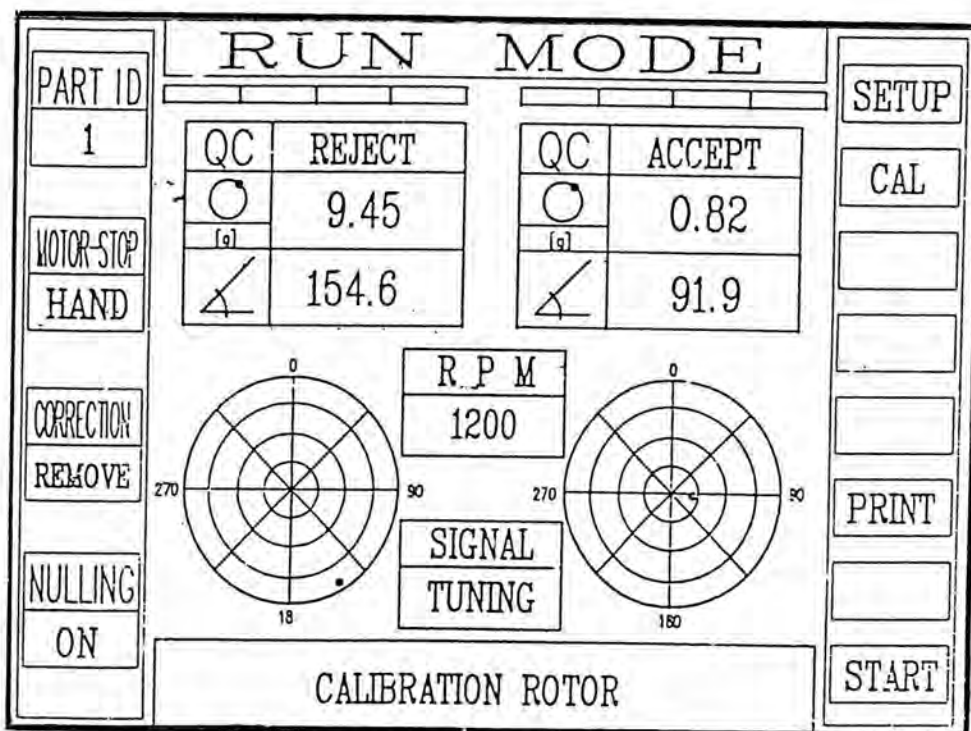


Figure 3 Run Mode Screen of Horizontal Balancing Machine

VITAE

Miss Vipaporn Mahajindawong was born on June 21, 1969 in Bangkok. She received her Bachelor's degree of science in chemistry from the Faculty of Science, Kasetsart University in 1993. She is working in marketing department, Thai Petrochemical Industry Public Company Limited.

She is pursuing a Master's Degree in Petrochemistry and Polymer, Graduate School, Chulalongkorn University, in 1996 and complete the program in 1998.